the contained soft structures. He writes, "In *Chiton* the external layer, which seems to be of a delicate fibrous texture, but which is of extreme density, is perforated by large canals, which pass down obliquely into its substance, without penetrating, however, as far as the middle layer."

My father-in-law, Dr. Gwyn Jeffreys, has pointed out to me that Costa* figures what are evidently the eyes on one of the intermediate shells of a very small species of *Chiton* (*Tonicia*) *rubicundus*. They are figured as mere black dots and referred to as fine punctuations, but their arrangement is correctly shown.

The late Dr. Gray†, in his well-known paper on the structure of the *Chitons*, wrote:—"The greater number of species have a part of the valve which is not covered by the mantle, but exposed. This exposed part consists of a perfectly distinct external coat, *peculiar, I believe*, to the shells of this family. The outer coat of these valves is separated from the lower or normal portion by a small space, filled by a cellular calcareous deposit, which is easily seen in a section of the valves."

I have prepared drawings illustrating the arrangement and structure of the eyes and other sense-organs in the shell in various genera of Chitonidæ, and hope to publish them with a more complete account of my results in the coming winter.

I beg to express my best thanks to Dr. Günther for giving me every facility in making use of the British-Museum collection. Dr. Woodward kindly went over the fossil *Chitons* in the Palæontological Department with me, but we could detect no traces of eyes in any of them. This is remarkable, since the ancient forms of the group appear to be allied to *Schizochiton*.

MISCELLANEOUS.

On the Submaxillary in Masticating Insects.

By M. J. Chatin.

The maxilla in masticating insects is supported by a basal piece the functional importance of which cannot be disputed, but which possesses a still greater interest from the point of view of the morphology of the parts of the mouth and even of the appendicular organs considered generally. Nevertheless it has hardly been even mentioned by a few writers, among whom we must cite Kirby and Spence, who gave it the name of the *cardo* (hinge), a term happily enough representing its mode of articulation; Brullé gave it the name of *submaxillary*, which I here retain, so as not to introduce any neologism into an exposition already full of details.

* 'Fauna di Napoli: Animali molli, Chitone,' taf. iii. fig. 1, *e*.

† J. E. Gray, "On the Structure of the *Chitons*." Phil. Trans. 1848.

In order to acquire a sufficiently exact knowledge of the fundamental characters of the submaxillary and of the variations which it may present, it is indispensable to multiply the objects of investigation and to select them with care, not limiting observations to a few common species which have been almost exclusively studied.

Oligotoma Saundersii may be taken as a starting-point for this series of analytical and comparative investigations. Its submaxillary in fact is very simple; it has the appearance of a small piece transversely developed and rising slightly on its internal surface, where a prominence, which will soon become more strongly marked in other types, is sketched out.

In *Œdipoda cinerascens* the form is already considerably modified, chiefly as regards the configuration of its lower surface. This is not only destined to limit the submaxillary towards its base, but it has also to provide for the articulation of the maxilla considered as a whole; the ginglymus, scarcely represented in *Oligotoma* by slight sinuosities, here gives rise to the formation of deep cavities which impress a peculiar physiognomy upon this region of the submaxillary. Entomologists have long since indicated the genus *Œdipoda* as one of those in which the maxilla is most firmly articulated with the head. It will be seen that this remark fully agrees with the results of anatomical analysis.

In *Decticus verrucivorus* the general aspect undergoes further changes, the origin of which must be sought in the inner and outer surfaces, but no longer on the basal surface. Each of the lateral surfaces commences with an inferior tuberosity; then comes an excavated middle part, surmounted by an upper portion, which is very prominent, especially at the outer surface. From this results a most singular form, which can only be correctly interpreted when we examine the submaxillary isolated and freed from the surrounding parts.

This dissection, always delicate, is particularly difficult in *Gryllus domesticus*, the submaxillary of which presents an appearance which, more than in the preceding types, justifies the name selected by Kirby and Spence; the depressions and articular facets of the inferior and superior surfaces, the orientation of the piece and its relations, all concur here to form a regular hinge.

On the other hand, the articulation of the maxilla is very feebly constructed in *Phasma japetus*, in which several of the characters proper to *Gryllus domesticus* are effaced. This tendency is still more strongly marked in *Mantis religiosa*; the submaxillary, chiefly developed vertically, becomes in that species almost abnormal, and in its general conformation greatly resembles some maxillaries.

In the great green grasshopper (*Locusta viridissima*) it better displays the double part assigned to it, of securing the articulation of the maxilla and forming for it a sufficiently solid base to support the whole organ, and thus to second or even replace the maxillary. Thus the inferior surface is deeply excavated, while the transverse dimensions become more appreciable.

The relative proportions of the different parts of the submaxillary

are so profoundly modified in *Hydrophilus piceus* that we have some difficulty in recognizing them, especially in a rapid examination. The inferior surface is undulated and the outer surface rather short; the inner surface presents a marked obliquity and bears a tuberosity which claims our more particular attention, because this arrangement, indicated in *Oligotoma Saundersii* &c., tends to become general in many other masticating insects.

The mandibles, as is well known, play the most active part in the division and mastication of food; but the maxillæ also assist in the operation to a variable extent according to the species, and the inferior projection of the inner surface from this point of view acquires particular importance. It did not escape Latreille, who sometimes mentions it under the name of *molar*. It is pretty constantly met with, but it presents frequent modifications. I confine myself to indicating the following:—

In *Carabus auratus* this prominence occupies an intermediate position between the lower and the inner surface; in *Forficula auricularia* it becomes conical and represents a lacerating rather than a grinding tooth; in *Blaps producta* it seems to be wanting, but its absence is compensated by a peculiar arrangement: the submaxillary considerably exceeding the maxillary, especially within, the inner surface of the submaxillary comes to project at the base of the maxillary, and may thus in its entirety fulfil the function generally reserved for the "molar" above indicated.

Although reduced to their essential points, the preceding descriptions suffice to show on the one hand all the interest that attaches to the morphological study of the submaxillary, and on the other the variations presented by this piece, which is too often overlooked, but the correct interpretation of which is indispensable in the comparative investigation of the appendicular organs in the Arthropoda. —*Comptes Rendus*, July 7, 1884, p. 51.

On a new Type of the Class Hirudineæ.

By MM. Poirier and A. T. de Rochbrune.

As the crocodile lives in the water, says Herodotus, the interior of his mouth is covered with Bdellas (Lib. II. Chap. lxviii. p. 94, ed. Müller). The translators of the Greek historian, down to Scaliger, understood the word βδελλέων to refer to leeches; since then several have asserted that these animals were Diptera of the genus *Culex*. The scientific researches of one of us during a pretty long sojourn in Senegambia enable us definitely to settle a still controverted question, and to prove that the Bdellas of Herodotus must be referred to the class Hirudineæ.

The remarkable type under consideration lives attached not only to the buccal mucous membrane of *Crocodilus vulgaris*, *cataphractus*, and *leptorhynchus*, but also to the lingual papillæ of *Gymnoplax ægyptiacus* and to the interior of the pouch of *Pelecanus crispus* and *onocrotalus*.

In its general form and the presence of branchial tufts on each